

THE POPLITEUS MUSCLE. By HUBERT HIGGINS,
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IN the course of my investigations on the knee-joint, I found that the popliteus was invariably connected with certain structures in the joint. I propose to enumerate its attachments, and to endeavour to show that it plays an important part in the mechanism of the joint.

- Origin (1) By short, strong tendinous and muscular fibres from the internal border of the tibia, under the internal lateral ligament.
- „ (2) By muscular fibres from the soleal line.
- „ (3) By a few scattered muscular fibres from the supra-soleal space between and from the bundles of the periosteal ligaments. The interstices contain some loose cellular tissue and fat, so that the muscle can be easily separated from the bone.
- „ (4) From the border of the internal tuberosity bounding the supra-soleal space above.
- „ (5) In rather more than 80 per cent. of cases a loosely attached rounded bundle of muscular fibres arises from the fibula immediately above the peroneo-tibial band, between the soleus and the tibialis posticus.

From this origin the fibres converge to immediately behind and internal to the head of the fibula; all or a varying proportion of the muscle fibres form a tendon, ovoid on section, which grooves the tibia over the cartilage-covered fibres of the posterior superior tibio fibular ligament, behind the external articular surface. After grooving the external semilunar cartilage it grooves the femur at the hinder part of the articular surface of the external condyle, and is inserted into a depression immediately below and anterior to that for the long external lateral ligament.

The tendon is connected with the following structures:—(1) The tibia. (2) The fibula. (3) The ligamentum posticum Winslowii. (4) The posterior crucial ligament. (5) Wrisberg's ligament. (6) The true capsule. (7) The external semilunar cartilage.

(1) *The Tibia.*

Among the deep set of fibular fibres on the inferior and deep surface of the tendon there are occasionally a few fibres blended with the coronary ligament and attached to the tibia.

(2) *The Fibula.*

Adherent to the superficial and deep surface of the tendon are two strong and distinct bands of fibres, passing from the fibula to one or all the following structures:—the posterior crucial ligament, Wrisberg's ligament, the posterior cornu of the external semilunar cartilage, or with the adjacent ligamentum posticum Winslowii directly or through some dense connective tissue.

(3) *Ligamentum Posticum Winslowii.*

In over 60 per cent. of specimens, tendinous fibres from the popliteus contribute to the formation of the ligament; they may even form the attachment of more than half the muscle, the thick accessory capsule being attached just beneath and on the inner side of the outer head of the gastrocnemius. In those specimens in which the muscle is not attached to the ligament the two are connected to it by some dense connective tissue.

(4 and 5) *The Posterior Crucial and Wrisberg's Ligament.*

There are in most specimens some fibres contributing to the oblique portion of the posterior crucial, derived from—

- (A) The tendon of the popliteus; or
- (B) That part which is occasionally attached to the ligamentum posticum Winslowii.

The following are the chief dispositions of these fibres:—

- (i.) They may be mixed with some irregularly disposed fibres on the outside of the posterior crucial, and attached to it immediately under the ligamentum posticum Winslowii.

- (ii.) They may run horizontally into the oblique portion being very tightly bound down at the angle of junction, and then continued upwards and inwards with the oblique crucial fibres.
- (iii.) They are usually connected with the fibres derived from the short external lateral ligament.
- (iv.) In some specimens Wrisberg's ligament is found to be connected with the fibres of the popliteal tendon, and frequently with those which are attached to the fibula.
- (v.) In one specimen some fibres which, from their femoral attachment, apparently represent Wrisberg's ligament, are only connected below with the tendon of the popliteus, to which they run at right angles.¹

The following are the commonest connections of the muscle:—

1. Directly, by means of fibres continued from the tendon, either posterior to or anterior to (uncommon) the popliteal groove on the cartilage.
2. Certain horizontally-disposed fibres, passing to the posterior crucial ligament from the popliteus, are intimately connected with the posterior cornu.
3. There may be a strong portion of the capsule connected with the superficial part of the tendon, and firmly connected with the cartilage anterior to the groove.
4. The posterior cornu, the popliteus, and the external semilunar may be connected by some dense irregularly arranged fibres which fill up the interval between them.

The conspicuous features in the attachment of the muscle are, that its main origin is from the most distant point on the tibia, the internal border, its intimate and constant connection with the posterior crucial ligament and the external semilunar cartilage, and the limitation of the excursion of its tendon imposed on it by the short, strong fibular bands. I think that the muscle either causes the tibia to rotate inwards when acting from the fixed femur, that it aids the outward rotation of the femur with the cartilage on the tibia, acting from the fixed

¹ I have postponed the relations of the tendon to the true capsule for consideration in a future paper.

tibia when the foot is resting on the ground. The value of the connection with the cartilage is that it secures its presence at the hinder part of the tibial articular surface during the completion of flexion. When the tibia rotates, the tense tendon retains the cartilage and prevents it being carried forwards; when the femur rotates, the cartilage is dragged with it. This rotation of the femur or tibia is for the purpose of compensating for the deficiency of about 2 cm. in the antero-posterior surface measurement of the external condyle, so that contraction through the space permitted by the fibular bands would be sufficient for the purpose.

The following considerations tend to show that rotation takes place either immediately before, after, or during the period that the leg is at right angles to the thigh,—

1. Owing to the attachment of the tendon being more than 2 cm. from the hindmost part of the external condyle, and the backward projection of the condyle, contraction at any period until half-way to the right angle is reached would only result in the compression of the articular extremities.

2. The ligaments are most relaxed at this period of contraction.

3. The femoral groove, which is in all probability caused by the tendon in its contraction, is directed upwards and backwards, and is not in the same direction as the tendon till the femur is at right angles to the tibia.

4. When sitting with the foot resting on the ground before and after the leg is at right angles to the thigh, the tibia can be slightly rotated and pushed forwards and outwards; the greatest movement takes place when the angle is just less than a right angle. Though during this movement there is contraction of the extensor and flexor muscles of the leg, the popliteus can be distinctly felt to contract.

5. The popliteus contracts, and its pressure produces the groove for its tendon, the direction being a little below the horizontal position in semiflexion, thus indicating that the muscle contracts during semiflexion.

After the rotation has taken place, the fibular bands would prevent any further action of the muscle; and if, as is probable, it is maintained in a state of contraction up till complete flexion,

it would be of service in keeping the external semilunar cartilage fixed, and to prevent it being pushed forward at the completion of flexion.

In those specimens where an unusually large proportion of the muscle is attached to the ligamentum posticum Winslowii, the direction of its action and the limitation of its excursion are provided for by strong oblique fibres running from the attachment of the muscle to the internal condyle.

Possibly the fibular origin is homologous to the coronoid head of the pronator radii teres.

In (complete) flexion the cartilages are wedged between the tibia and the hindmost parts of the articular surfaces, producing more or less distinct grooves, both on the external and internal articular surfaces.